WHAT IS CLAIMED IS:

1. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide, said method comprising the steps of:

a) providing a hot gas stream from a source thereof, said hot gas stream comprising a desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide;

b) providing a mechanical separation device for separating any solids from said hot gas stream;

c) feeding the hot gas stream into the mechanical separation device at a temperature that is less than the boiling temperature of the desired metal oxide and greater than the boiling temperature of the at least one additional volatile metal/metal oxide and metal halide present in the gas stream so as to separate the desired metal oxide from the at least one additional volatile metal/metal oxide and metal halide present in the gas stream; and

d) collecting the separated desired metal oxide.

2. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein in step a) the hot gas stream comprises a volatile metal which is oxidized to form the desired metal oxide that is separated in step c).

3. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 2, wherein a source of oxygen is added to the hot gas stream to form the desired metal oxide that is separated in step c).

4. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the metal oxide that is separated in step c) comprises zinc oxide.

5. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the hot gas stream is provided from a furnace.

6. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal halide according to claim 1, wherein the mechanical separation device comprises at least one of a cyclone separator, a settling chamber, an impingement separator, an impaction separator and a mechanical filter.

7. A method for removing a desired metal oxide from a hot gas stream that comprises the desired metal oxide and at least one of an additional volatile metal/metal oxide and a metal

halide according to claim 1, wherein the additional volatile metal/metal oxide comprises a halide compound.

8. A method of recovering a volatile metal from a metal processing feed which comprises the steps of:

a) providing a metal processing apparatus in which metal mixtures can be heat processed;

b) feeding into the metal processing apparatus a mixture of volatile metals and metal compounds together with a reductant capable of reducing metal compounds to pure metals;

c) heating the contents of the metal processing apparatus to cause volatile materials to form a released gaseous mixture including a desired volatile metal component;

d) feeding the released gaseous mixture into a mechanical separation device;

e) separating the desired volatile metal component from the remaining portion of the released gaseous mixture; and

f) collecting the separated desired volatile metal component.

9. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the mixture of volatile metals and metal compounds comprises a first feed that contains the desired volatile metal component and a second feed that contains the reductant.

10. A method of recovering a volatile metal from a metal processing feed according to claim 9, wherein the mixture of volatile metals and metal compounds further comprises an additional feed of an iron-containing material.

11. A method of recovering a volatile metal from a metal processing feed according to claim 10, wherein the iron-containing material comprises at least one of scrap iron, iron ore, sinter dust and basic oxygen furnace sludge.

12. A method of recovering a volatile metal from a metal processing feed according to claim 9, wherein the first feed comprises electric arc furnace dust.

13. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the reductant comprises a carbon source.

14. A method of recovering a volatile metal from a metal processing feed according to claim 13, wherein the carbon source comprises coke.

15. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the metal processing apparatus comprises a furnace.

16. A method of recovering a volatile metal from a metal processing feed according to claim 15, wherein the metal processing apparatus comprises at least one of an induction furnace, an open hearth furnace, a rotary kiln, a tunnel kiln and a rotary hearth furnace.

17. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the mechanical separation device comprises at least one of a cyclone separator, a settling chamber, an impingement separator, an impaction separator and a mechanical filter.

18. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein a source of oxygen is combined with the released gaseous mixture to oxidize the desired volatile metal component before step e).

19. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the desired volatile metal component comprises zinc.

20. A method of recovering a volatile metal from a metal processing feed according to claim 8, wherein the mixture of volatile metals and metal compounds comprise a halide compound.

21. A method of recovering zinc from electric arc furnace dust which comprises the steps of:

a) combining electric arc furnace dust with at least a reductant capable of reducing zinc oxide to zinc in a thermal processing apparatus;

b) heating the thermal processing apparatus to cause reduced zinc oxide to vaporize together with other volatile components;

c) oxidizing the vaporized zinc;

d) feeding the oxidized zinc and other volatile components into a mechanical separation device capable of separating the oxidized zinc from the other volatile components; and

e) collecting the separated oxidized zinc.

22. A method of recovering zinc from electric arc furnace dust according to claim 21, wherein in step a) the electric arc furnace dust is further combined with an iron-containing material.

23. A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the iron-containing material comprises at least one of scrap iron, iron ore, sinter dust and basic oxygen furnace sludge.

24. A method of recovering zinc from electric arc furnace dust according to claim 21, wherein a source of oxygen is added to the zinc vapor in step c) to oxidize the zinc vapor.

25. A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the mechanical separation device comprises at least one of a cyclone separator, a settling chamber, an impingement separator, an impaction separator and a mechanical filter.

26. A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the thermal processing apparatus comprises at least one of an induction furnace, an open hearth furnace, a rotary kiln, a tunnel kiln and a rotary hearth furnace.

27. A method of recovering zinc from electric arc furnace dust according to claim 21, wherein the collected zinc oxide is further processed to obtain purified zinc.